

due to a constantly increasing attraction exerted by the sun upon a constantly diminishing mass.

Of course, if this novel theory can stand the test of a full comparison with facts, it will have established its claim to become part of science. But it is hard to take leave of the simple old ideal comet:—the swarm of cosmical brickbats:—something imposing because formidable; and to see it replaced by what is, in comparison, a mere phantom, owing its singular appearance to the complexity of the physical properties it possesses and the recondite transformations perpetually taking place in its interior. The old idea of a comet's constitution was not only formidable, but was capable of explaining so much, and of effecting this by means so simple and so natural, that one almost felt it deserved to be well-founded! The new idea makes it resemble the huge but barely palpable 'Efreet of the *Arabian Nights*, who could condense himself so as to enter the bottle of brass with the seal of Suleymán the son of Dáood!

It is much to be desired that more detail had been bestowed on the nebulae. As nothing is said about the origin of their incandescence, we must take for granted that it is supposed to be due to gravitation. A few rough numerical assumptions as to dimensions, total mass, &c., and the consequent thermal condition at each stage of condensation, would have formed materials for a most instructive explanatory note.

The last lecture deals with solar protuberances; the (so-called) Döppler's principle, and the results of its application; and, finally, with the body of the sun. The explanation given of the peculiar and rapidly changing structure of the sun's apparent disc, which is so well shown in Janssen's splendid photographs, reminds us of a suggestion made several years ago:—viz. that a succession of instantaneous photographs should be taken, at short intervals, of so homely an object as a basin of very hot "beef-tea," which has been agitated so as to bring the flocculent matter fully into suspension, and is then left to itself as nearly as possible free from rotation.

The passages in the present volume which, taken by themselves, would indicate the ulterior object of the lectures are not numerous, and nowhere bear the appearance of having been inserted for a purpose, so naturally do they arise as comments on what has just been discussed.

We wish the Author as high a measure of success in his final effort, the most arduous of the three, as he has already attained in the others:—it would be preposterous to wish him a higher. The series will then form an exceedingly valuable contribution to a class of literature in which marked success is scarcely attained once per generation, and is justly valued in proportion to its rarity.

P. G. TAIT

AGRICULTURAL EXPERIMENTS

Review of Agricultural Experiments by the Right Hon. Sir Thomas Dyke Acland. (London: Clowes and Co., 1885.)

THIS purports to be a critical review with suggestions, and is actually an attack upon the objects, aims, and results of the Sussex Association for the Improvement of Agriculture. The writer brings a long experience and a good business faculty to bear upon the working of

a scientific organisation, and with some success so far as these instruments may be used as tests of the value of a delicate task requiring very special knowledge. The attitude of mind of the reviewer of these experimental results is one of scepticism. This he does not scruple to express in such terms as "we all felt rather sceptical," and "we suspected," and "I have made in all four visits to Sussex to endeavour to get at the truth." Again, "Well, thought I, this must be a queer kind of farming, perhaps I shall enlarge my experience. I think I have made out since that the local experience, however practical, may be the better of a little expansion." With such introductory remarks we can hardly look for the cold judicial criticism that commands attention and carries conviction.

The inquiries of the Sussex Association have been directed to very practical questions, viz.:—

What do roots (turnips, mangolds, &c.) require?

What do wheat and other cereals require?

What does grass or pasture require?

These objects Sir Thomas Acland appears to view in two opposite and irreconcilable ways. First, he seems to doubt the possibility of these questions being solved by experimental processes. Secondly, he appears to consider that they have all been answered long since. He thus discounts the value of the Sussex results from two points of view, each of which is destructive of the other. It is true that the leading facts constituting the answers to the above important questions have now been firmly established for many years, and that these answers were known almost a generation ago to such leading men as the late Philip Pusey, and all more recent scientific agriculturists. The value of such stations as that known as the Sussex Association consists in its power of impressing and verifying such facts, as well as in discovering new ones, and we think, under Mr. Jamieson's able guidance both of these objects are being accomplished. Among new ideas promulgated by the Sussex Association is that which is paragraphed by Sir Thomas Acland under the heading, "Battle of the Phosphates." Mr. Jamieson's contributions upon this important subject are passed over with something akin to contempt, and yet (however distasteful his conclusions may be to manufacturers of "superphosphates") his results remain unrefuted, and the most recent experiments at Woburn point, on the whole, to similar conclusions. The establishment of the value of "insoluble" phosphatic minerals reduced to a fine state of division is due in a great measure to Mr. Jamieson, and he has incurred no little unfriendly criticism on account of this new doctrine, which touches the pockets of certain strong interests. This is altogether the leading truth brought out and fought for by Mr. Jamieson, and yet it is dismissed by Sir Thomas Dyke Acland in a manner which appears to the present writer as simple superciliousness.

One could scarcely expect to read sixty-four pages of printed matter from the pen of Sir Thomas Dyke Acland without finding grain as well as "chaff." We therefore wish to set forth the useful criticisms which the Sussex Association would do well to notice. First, then, there is the fallacious method adopted in endeavouring to translate field results into money values. Not content with leaving the number of bushels per plot and pounds of straw increase to the judgment of the reader, an effort has been

made to put a value upon these increased quantities. In valuing wheat at 5s. per bushel and straw at 2l. per ton the compilers of the report made a great mistake, of which their critic has not been slow to avail himself. Here he "shells" them unmercifully and effectually, especially as the straw at 2l. per ton turns out to be the chief item for turning loss into profit.

This is, however, entirely an artificial value, the result of restricted supply, and Sir Thomas is perfectly justified in dismissing the item entirely by compounding it with the cost of the farmyard manure, letting straw and manure mutually discharge each other's claims.

Another point successfully urged is the smallness of the plots. What possible reliance can be placed upon plots 112th of an acre in which pounds per plot are at once alleged to represent hundredweights per acre. The multiplication of unavoidable errors, and the exaggerations of extremely local differences in the soil itself, are simply fearful to think of. The larger the area the better. If acre-plots could be used so much the better, and 10-acre plots would be better still—the only limit in size being, to our mind, convenience. But 112th parts of acres must induce a feeling of distrust in the breasts of those who are practically acquainted with land. The sources of error may be enumerated as follows:—imperfect distribution, unavoidable waste in distribution, minute differences in the soil, irregular germination of the seed, partial insect attacks, direct accidental injuries or the reverse (as, for example, an animal trespassing upon a plot, or a horse dropping his dung upon it), errors in weighing, errors in severance from the ground, and other unavoidable difficulties which belong to the carrying out of field experiments,—all of these errors are magnified in the case of small plots, and minimised by the use of large ones. In these directions the criticisms made by Sir Thomas Acland are valuable: but we should like to have seen a greater sympathy with an honest effort, and less anxiety to hold up any results of value as stale, antiquated, and unnecessary.

Any one who has lived as long as Sir Thomas Dyke Acland must know that the proclamation of things old as things new is not confined to agricultural chemists, and he should be more ready to accept as inevitable the *dictum* of the wise man, that "the thing that hath been, it is that which shall be; and that which is done is that which shall be done."

THE NEW EDITION OF "YARRELL'S BRITISH BIRDS"

A History of British Birds. By the late William Yarrell, V.P.L.S., F.Z.S. Fourth Edition, Revised to the End of the Second Volume by Alfred Newton, M.A., F.R.S., continued by Howard Saunders, F.L.S., F.Z.S. Parts xx.-xxx. (London: Van Voorst.)

THE students of British birds have at last received the two final numbers of the new edition of Yarrell's celebrated work on their favourite subject, which was commenced as long ago as 1871. Fourteen years, it must be acknowledged, is a long time to wait, but on the other hand the subscribers to the new "Yarrell" have in compensation of the delay not what would be called in ordinary parlance a new edition, but what is, in fact, a complete and exhaustive summary of the present state of

our knowledge of this subject, prepared by two of the greatest living authorities on British ornithology.

The two first volumes of the fourth edition of "Yarrell's British Birds," which were brought to a conclusion by Prof. Newton in 1882, were devoted to the birds of prey, the passerine birds, and the picarians. In June of that year Mr. Saunders undertook to finish the work, "not willingly nor with a light heart," but, as he tells us, "after considerable pressure and at much personal sacrifice." Forewarned by what had previously occurred, Mr. Van Voorst insisted that time must be part of the "essence of the contract," and stipulated with the new editor for the completion of the third and fourth volumes by June 1885, which, after allowing for six months' leave of absence, gave Mr. Saunders only two years and a half to prepare his account of nearly two hundred species. It cannot be denied that this was somewhat severe upon the new editor, and that, considering the pressure brought to bear upon him, the mode in which he has completed his task within the time assigned to him, deserves our highest compliments.

As has been already pointed out the so-called new "Yarrell" is, in fact, a new work. The vast amount of knowledge of British birds and their distribution acquired during the forty-two years which have elapsed since Yarrell's original work first appeared, rendered it absolutely necessary that such should be the case. It would have been much better, in our opinion, to have discarded the name of Yarrell altogether, and to have employed the leading ornithologist of the period to write a new work on British birds. But as Mr. Van Voorst, doubtless for sufficient reasons, preferred to retain the time-honoured name of Yarrell on the title-page, the new "editors" as they call themselves have, we think, surmounted the difficulties of their position with singular success. Where practicable, we are told, the original phraseology has been followed with due modifications, the opening words of the sentences have been preserved, and extracts from the authors and correspondents quoted by Yarrell have been retained. "This work of selection and adaptation has," we can well believe, "entailed severe labour." It is obvious, in fact, that it would have been a much simpler task to write most of the articles new from the beginning than to adapt those prepared by the original author fifty years ago to present use. The former plan would also, we think, have been more satisfactory to the reader, who between the "author" and the two "editors" and the friends and correspondents of each of them, is in many cases likely to be misled as to the real authority quoted for a particular statement.

While, as we have already said, the general execution of the "new Yarrell" merits our entire commendation, the systematic arrangement—an unsuccessful effort at a compromise between the old fashion and the new—does not seem to deserve equal praise. No doubt the order adopted by first editor for the three groups treated of in the first two volumes placed the second editor in a difficulty. But we cannot think that Mr. Saunders was thereby justified in relegating the Steganopodes, Herodiones and Anseres to the end of the series. With these groups he should have begun the second volume, not finished the third. At the same time it must be borne in mind that the primary object was not a strictly orthodox